



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/609,097	06/27/2003	William A. Stanton	2269-5858US	9228
24247	7590	09/07/2006	EXAMINER	
TRASK BRITT P.O. BOX 2550 SALT LAKE CITY, UT 84110			RUGGLES, JOHN S	
			ART UNIT	PAPER NUMBER
			1756	
DATE MAILED: 09/07/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/609,097	Applicant(s) STANTON ET AL.	
	Examiner John Ruggles	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 23-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☒ Claim(s) 4, 11 and 12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

In the submission filed on 7/10/06, claims 1-4, 7-10, and 15-22 are currently amended, claims 5 and 11-13 remain as previously presented, claims 6 and 14 remain as originally filed, and claims 23-26 remain withdrawn as previously non-elected **without** traverse. Therefore, only claims 1-22, as currently amended, remain under consideration.

Withdrawn claims 23-26 have become the subject claims of divisional (DIV) application 11/336,229 filed on 1/20/06 (which claims priority to the instant parent application). Therefore, a complete reply to this final rejection must include cancellation of these nonelected claims or other appropriate action, as indicated below.

The previous objections to the abstract are withdrawn in view of Applicants' current amendment, as stated below.

The previous specifically identified exemplary objections to the specification numbered (1)-(4), as well as many others not previously exemplified, have been addressed by the current amendment and are therefore withdrawn. However, further reasons for objection to the specification remain, as exemplified below.

The previous objections of claims 1-22 listed as (i)-(v) are withdrawn in view of current amendments to the applicable claims. However, other objections of claims 4 and 11-12 are set forth below.

Some of the previous rejections of claims under the first and second paragraphs of 35 USC 112 are withdrawn in view of Applicants' current claim amendments and accompanying remarks, as stated below.

Art Unit: 1756

However, several others of the previous rejections of claims under the first and second paragraphs of 35 USC 112 are maintained below, at least in part (with modifications necessitated by current amendments), because these remaining rejections have not been sufficiently addressed by Applicants' current amendments and accompanying remarks.

The previous prior art rejections under 35 U.S.C. 102(b) and 103(a) are revised below as necessitated by Applicants' current claim amendments and accompanying remarks.

The previous obviousness-type double patenting rejections are also maintained below in revised form, as necessitated by amendment.

Election/Restrictions

This application contains withdrawn claims 23-26 drawn to an invention previously nonelected **without** traverse in the response filed on 1/17/06. In fact, these withdrawn nonelected claims have even become the subject claims of divisional (DIV) application 11/336,229 filed on 1/20/06 (which claims priority to the instant parent application). Therefore, a complete reply to this final rejection must include cancellation of these nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Specification

The previous objections to the abstract are withdrawn in view of Applicants' current amendment.

The previous specifically identified exemplary objections to the specification numbered (1)-(4), as well as many others not previously exemplified, have been addressed by the current amendment and are therefore withdrawn. However, further reasons for objection to the specification remain, as exemplified below.

Art Unit: 1756

35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms, which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are: (5) in [0038] line 5, "Design feature 66 ultimately corresponds to elements" should be corrected to --Design features 66 ultimately correspond[[s]] to elements--; (6) in [0038] line 8, "a radius about the feature" should be changed to --a radius ~~about the~~ around each feature--, in order to better correspond to e.g., [0039] lines 2-3, etc. and the instant claims as currently amended (e.g., instant claim 1 line 5, etc.); and (7) similar further changes should also be made throughout the specification wherever appropriate. Note that due to the number of errors, those listed here are merely *examples* of the corrections needed and do *not* represent an exhaustive list thereof.

Appropriate correction is required. An amendment filed making all appropriate corrections must be accompanied by a statement that the amendment contains no new matter and also by a brief description specifically pointing out which portion of the original specification provides support for each of these corrections.

Claim Objections

The previous objections of claims 1-22 listed as (i)-(v) are withdrawn in view of current amendments to the applicable claims. However, other remaining objections are set forth below.

Claims 4 and 11-12 are objected to because of the following informalities: (vi) in claim 4 line 2, "forming at least one sidelobe inhibitor" should be changed to --forming the at least one sidelobe inhibitor-- that finds antecedent basis in the "at least one sidelobe inhibitor" recited in

Art Unit: 1756

claim 1 line 8 (on which claim 4 depends); (vii) in claim 11 line 4, the phrase “when one or more sidelobe inhibitors are” should be changed to --when ~~one or more~~ the at least one other of the sidelobe inhibitors ~~[[are]]~~ is--, in order to correspond with this latter phrase recited earlier in claim 11 lines 2-3; and (viii) similarly in claim 11 line 6, “the one or more sidelobe inhibitors” should be corrected to --the first one ~~or more~~ of the sidelobe inhibitors and the at least one other of the sidelobe inhibitors--. Claim 12 depends on claim 11. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The previous rejection of claims 2, 9, 17, and 21 under the first paragraph of 35 USC 112 due to non-enablement of a diffraction ring radius (represented by 68 in instant Figure 10) of $\sim 0.8\lambda$ is withdrawn in view of Applicants' current claim amendments reciting a diffraction ring radius of $\sim 0.8\lambda/NA$ (which is enabled by [0038] lines 9-10, as previously pointed out).

The previous rejections of claim 1 lines 1-2, claim 3 line 2, claim 7 lines 13-14 (on which claims 8-14 depend), claim 10 line 2, claim 18 line 2, claim 21 line 2, and claim 22 line 2 under the second paragraph of 35 USC 112 are also withdrawn in view of Applicants' current claim amendments and accompanying remarks.

However, several others of the previous rejections of claims under the first paragraph of 35 USC 112 and the previous rejections of claims under the second paragraph of 35 USC 112 are maintained below, at least in part (with modifications necessitated by current amendments), because these remaining rejections have not been sufficiently addressed by Applicants' current amendments and accompanying remarks.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

Art Unit: 1756

pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 8-9 and 11-12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contain subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The claim 8 recitation for each of the mathematical descriptions of diffraction rings (70 in Figure 10) to be defined from a “centroid” of the mathematical description of one of the elements (66 in Figure 10) is still not found to be supported in the specification. Instead, the specification at [0011]-[0014] in reference to Figures 4-7 describes “centered” configurations of circles (e.g., sidelobe (46) diffraction rings, etc.). Therefore, as indicated previously and again for the purpose of this Office action, “centroid” in claim 8 has been interpreted to mean ~~--centroid~~ center--, in accordance with the specification. Claim 9 depends on claim 8.

Furthermore, in claim 11 lines 4-5, the phrase “more proximate than a predefined threshold” with regard to the proximity of two or more sidelobe inhibitors (77 in Figure 10) is also not sufficiently enabled by the specification. Claim 12 depends on claim 11.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-14, 16, and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Art Unit: 1756

In claim 1 line 4 and in claim 7 lines 4-5, the phrase “to create desired patterns **and** resultant sidelobes” (emphasis added) seems to suggest creating desired sidelobes that does not correspond with either (A) the earlier stated intention for mitigating sidelobe artifacts (in claim 1 line 1) by forming at least one sidelobe inhibitor (in claim 1 line 8) nor (B) the recited generating of sidelobe inhibitors (in claim 7 line 1) or the forming of at least one sidelobe inhibitor (in claim 7 line 12). For the purpose of this Office action, the above phrase in claim 1 line 4 has been interpreted to mean --to create desired patterns **and** resultant mitigated sidelobes-- and the above phrase in claim 7 lines 4-5 has been interpreted to mean --to create desired patterns **and** resultant inhibited sidelobes--. Claims 2-6 depend on claim 1 and claims 8-14 depend on claim 7.

In claim 4 lines 3 and 5-6, it is unclear whether “an overlap range” (in line 3) and “an overlapping area” (in each of lines 5-6) were intended to be (3) an overlap range (or an overlapping area) of adjacent diffraction rings 70 shown in Figure 10 as described in [0039] lines 5-8 or (4) a guard ring (102 or 104) extending around each of the plurality of locations (92 and 94) shown in Figure 12A as described in [0042] such that a portion of an overlapping area or guard ring from one of the locations is common or overlaps with a portion of another overlapping area or guard ring from another one of the locations. For the purpose of this Office action, “an overlap range” in claim 4 line 3 has been interpreted to mean --~~an overlap range~~ a guard ring-- and “an overlapping area” in claim 4 at each of lines 5-6 have been interpreted to mean --~~an overlapping area~~ the guard ring-- (in claim 4 at each of lines 5-6), in accordance with (4) above.

Also for the purpose of this Office action, the phrase “the locations” in claim 4 at each of lines 4-7 have been interpreted (at all four occurrences) as being corrected to --the plurality of

Art Unit: 1756

locations--, in order to better correspond with the antecedent basis for this phrase “plurality of locations” found in claim 4 line 2.

Similar problems still remain in claim 16 with “an overlap range” (in claim 16 line 3), “the intersections” (at all five occurrences in each of lines 3-7 in claim 16), and “an overlapping area” (at both occurrences in claim 16 lines 4-5 and 5-6). In order to address these similar problems found in claim 16 (in relation to those in claim 4 as mentioned above), claim 16 lines 3-8 have been interpreted as follows: --defining ~~an overlap range~~ a guard ring extending around each of the plurality of intersections; defining a common intersection in lieu of each of the plurality of intersections when a portion of ~~an overlap range~~ the guard ring extending from one of the plurality of intersections is common with a portion of ~~an overlap range~~ the guard ring extending from another one of the plurality of intersections; and forming a sidelobe inhibitor[[s]] across at least a portion of each of the plurality of intersections [[and]] or across the common intersection--.

Also in claim 4 at lines 8-9, the phrase “common locations” (plural) is still not consistent with the previous recitation of a single common location in claim 4 at line 4 (as previously pointed out and not addressed by Applicants). For the purpose of this Office action, the above phrase in claim 4 lines 8-9 has been interpreted to mean --common location[[s]]-- (singular).

In claim 9 lines 1-2, the phrase “the mathematical description of diffraction ring” (singular) does not correspond with the immediately preceding antecedent basis for this phrase found in claim 8 lines 1-2 (which is in plural form). However, for the purpose of this Office action and in order to advance the prosecution of this application, the above phrase in claim 9

Art Unit: 1756

lines 1-2 has again been interpreted to mean --the mathematical descriptions of diffraction rings-- (plural).

In claims 11-12, it is still uncertain whether the “predefined threshold” (found in claim 11 lines 4-5 and claim 12 lines 1-2) with regard to the proximity of two or more sidelobe inhibitors (77 in Figure 10) is meant to be measured (5) between the closest outer edges, (6) between the centers of the “more proximate” sidelobe inhibitors, or (7) on some other basis, so that the “predefined threshold” for the proximity is about half to about one of the defined wavelength of radiation (claim 12, $\sim\lambda/2$ to $\sim\lambda$). For the purpose of this Office action and in order to afford the broadest reasonable interpretation to claims 11-12, the “predefined threshold” has been interpreted to mean either (5) or (6) as set forth above. Applicants must clarify the record on this issue.

In claim 20, the recitation of separate “identifying” steps (in lines 2, 3, and 5) is still not fully clear about the differentiation or specific meaning of each of the latter two steps (in lines 3 and 5) with respect to the “identifying the intersect” in claim 19 line 8 (on which claim 20 depends). For the purpose of this Office action, these latter two “identifying” steps in claim 20 lines 3 and 5 have been further interpreted to be clarified as follows: (b) in line 3, “identifying ones of intersects” has been interpreted to mean --first identifying identification of ones of one intersect[[s]]--; and (c) in line 5, “identifying a common intersect in lieu of intersects resulting in overlap” has been interpreted to mean --second identifying identification of a common intersect intersect, in lieu of intersects resulting in ~~overlap~~ overlap--.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5-10, 13-15, 17-19, and 21-22 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hasegawa et al. (US Patent 5,700,601).

Hasegawa et al. teach a phase shifting photomask (*instant claims 6 and 14*), mask (PSM), reticle (*instant claims 5 and 13*), or radiation-patterning tool that has a transparent main pattern area (passing non-PS radiation, e.g., light at 0°, etc.) in a semi-transparent film (also a phase shifter passing PS radiation, e.g., light at 180°, etc.) and a transparent auxiliary pattern of sidelobe inhibitor(s) (that passes radiation in the same phase (non-PS) as that of the transparent main pattern area, e.g., light at 0°, etc.) placed around or near the main pattern area to prevent generation of an unnecessary projected image (for mitigating, suppressing, or inhibiting sidelobes), a system for designing the mask, and a method for manufacturing the mask (title, abstract). Figures 3 and 9-10 (embodiments 2 and 4, respectively) show a radius (D, D') from

Art Unit: 1756

the center or centroid of a main circular or square feature or opening (4, 8) to an undesirable diffraction ring, where one or more sub-resolution dimension transparent auxiliary patterns or sidelobe inhibitors (5, 9) that pass radiation in the same phase as the main pattern and are placed at optimum positions with respect to the main pattern that would be expected to suppress sidelobe printing (col. 20 line 41 to col. 21 line 56, col. 22 line 40 to col. 23 line 19, col. 27 lines 46-55, and col. 29 line 66 to col. 30 line 8). The diffraction ring radius $(D, D') = b\lambda/NA_m$, where $1.35 < b \leq 1.9$, λ is the wavelength of exposure light or radiation, and NA_m is the mask-side numerical aperture of the projection lens (abstract). The auxiliary patterns or sidelobe inhibitors are either continuous (5 as shown in Figure 3) or separated into plural elements (9 as shown in Figures 9-10). Figures 16(b) and 17 in embodiment 8 show the effect of auxiliary sidelobe inhibitor square patterns with two closely spaced square main patterns (the radius of the corresponding diffraction ring $(S) = s\lambda/NA$, where $S = 650\text{nm}$, $\lambda = 365\text{nm}$, $NA = 0.52$, and $s = 0.926$, which means that the radius $S = 0.926 \lambda/0.52 \sim 0.9\lambda/NA$ or the radius (S) is about $0.8\lambda/NA$ to reduce the undesirable sidelobe intensity peaks at P2 and P3 as shown in curve "d" of Figure 17, while the width of the auxiliary sidelobe inhibitor square patterns $I = 200\text{nm} = i\lambda/NA$, leading to $i = 0.285$ so that the width $I = 0.285\lambda/0.52 = 0.548\lambda \sim 0.5\lambda$ (col. 26 line 56 to col. 27 line 55, reading on the *instant claims 2, 9, 17, and 21* for a diffraction ring radius of about $0.8\lambda/NA$ and also reading on *instant claims 3, 10, 18, and 22* for a sidelobe inhibitor side dimension or width of about $\lambda/2$). Embodiment 5 describes the use of a computer system and associated data file unit (understood to necessarily include a computer-readable medium having computer-executable instructions and/or similar other means for calculating intersections of diffraction rings around each element) to design the layout of the size(s) and desired position(s)

Art Unit: 1756

for the auxiliary sidelobe inhibitor patterns with respect to the main patterns on the mask (col. 23 line 20 to col. 24 line 67), which is believed to be inherently or obviously capable of performing the necessary calculations for defining main pattern elements and mathematical descriptions of associated diffraction rings or even guard rings, each diffraction ring having a predetermined radius ($S = \text{about } 0.8\lambda/\text{NA}$, as discussed above), and the intersections thereof for determining the placement locations of plural auxiliary sidelobe inhibitor patterns (each having a width or side dimension of about $\lambda/2$, as discussed above) with respect to the main pattern elements on the mask (reading on *instant claims 1, 7-8, 15, and 19*).

Claims 4, 11-12, 16, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. (US Patent 5,700,601) in view of Kobayashi et al. (US Patent 5,700,606).

Hasegawa et al. do not specifically teach designing a mask pattern having a single sidelobe inhibitor at a single common location in lieu of separate sidelobe inhibitors at plural locations and a computer-readable medium having computer-executable instructions thereon for designing this mask pattern (as required by *instant claims 4, 11-12, 16, and 20*).

Kobayashi et al. teach a photomask, mask, reticle, or radiation-patterning tool having a patterned halftone film with an overlying light-shielding pattern at a position from which a sidelobe would be formed (the light-shielding pattern functions to prevent, inhibit, suppress, or mitigate a sidelobe) and a method of manufacturing it (title, abstract). Figures 7(a-c) and 8(a-c) show examples of overlapping/intersecting diffraction rings 12 (each around a main contact opening 11 that is adjacent to another main contact opening 11) for determining the placement of a sidelobe inhibitor on the mask at intersection 14 of adjacent diffraction rings to make circular images for contact holes with reduced, inhibited, or mitigated undesirable sidelobes 16 as shown

Art Unit: 1756

in Figs 7(c) and 8(c) (col. 2 lines 48-59). The intensity of unwanted sidelobes becomes greater at closer pitches for main contact openings on the mask having a greater number of diffraction ring overlaps. The position of sidelobe generation from identified diffraction rings, each around a main contact opening in the mask pattern, can be calculated from the pattern size, pitch, and exposure conditions (col. 5 line 48 to col. 6 line 23, which encompasses the use of a guard ring extension or another similar mathematical construct around each intersection location between adjacent diffraction rings). A first mask having plural sidelobe inhibitors 3 is shown by Figures 2(a-b), in which the sidelobe inhibitors 3 have a width W_1 for a first spacing between adjacent main contact openings on the mask, such that only two corresponding adjacent diffraction rings form intersections therebetween, as shown by position "II" in Fig 8(a). Figures 3(a-b) show an alternative second mask having a single common sidelobe inhibitor 3 with a width W_2 that is centrally located between 4 main contact openings positioned at a second closer spacing than those on the first mask such that more than two corresponding adjacent diffraction rings form plural intersections therebetween, instead of or in lieu of placing overlapping sidelobe inhibitor(s) at each of plural diffraction ring intersections at or near a common location, as shown by position "I" in Fig 8(a) (col. 6 line 46 to col. 7 line 24). The method of manufacturing such masks is described at col. 7 line 25 to col. 9 line 24) in reference to Figures 1(a-g). With this method, it is easy to place the sidelobe inhibitor pattern at predetermined position(s) on the mask with high accuracy to prevent, inhibit, suppress, or mitigate sidelobe printing from the mask (col. 4 lines 1-4).

It would have been obvious to one of ordinary skill in the art at the time of the invention in the photomask, mask, reticle, or radiation-patterning tool that has a transparent main pattern

Art Unit: 1756

area (passing non-PS radiation, e.g., light at 0° , etc.) in a semi-transparent film (also a phase shifter passing PS radiation, e.g., light at 180° , etc.) and a transparent auxiliary pattern of sidelobe inhibitor(s) (that passes radiation in the same phase (non-PS) as that of the transparent main pattern area, e.g., light at 0° , etc.) placed around or near the main pattern area to prevent generation of an unnecessary projected image (for mitigating, suppressing, or inhibiting sidelobes), a system for designing the mask, and a method for manufacturing the mask (taught by Hasegawa et al. and discussed above) to design the mask pattern having a single sidelobe inhibitor at a single common location in lieu of separate sidelobe inhibitors at plural locations, when needed to accommodate the greater intensity of unwanted sidelobes at closer pitches for main contact openings on the mask having a greater number of calculated and identified diffraction ring overlap intersections at or near a common location (taught by Kobayashi et al. as illustrated in Fig 8(a) for the position "I" mask patterns at a closer pitch having a greater number of diffraction ring overlaps in comparison to the position "II" mask patterns at a more distant pitch having a lesser number of diffraction ring overlaps). With this combined method of designing the mask and a computer-readable medium having computer-executable instructions thereon for designing this mask pattern, it is easy to calculate diffraction rings corresponding to the position and size of plural main contact openings on the mask, identify intersection location(s) for adjacent diffraction rings (e.g., with a guard ring extension or another similar mathematical construct around each intersection location for defining a common location in lieu of plural locations when such plural locations are closer or more proximate than a predetermined threshold (*instant claim 11*) to avoid overlap of plural sidelobe inhibitors each having a width or side dimension of about $\lambda/2$ (as discussed above, *instant claim 12*) or when plural guard ring

Art Unit: 1756

extensions overlap (*instant claims 16 and 20*), etc.), and place one or more sidelobe inhibitor pattern(s) at predetermined position(s) on the mask with high accuracy to prevent, inhibit, suppress, or mitigate sidelobe printing from the mask, as taught by Hasegawa et al. and Kobayashi et al. (reading on *instant claim 4*).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-3, 5-10, 13-15, 17-19, and 21-22 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 6-12, 14-18, 20, 22, 24-25, 35-38, and 43-46 of US Patent 6,807,519 (Stanton '519) in view of Hasegawa et al. (US Patent 5,700,601, as discussed above). The conflicting claims of Stanton '519 are not identical to the instant claims, at least because the Stanton '519 patent claims recite relative spatial orientations of mask elements and vectors spanning between edges of design features within a

Art Unit: 1756

threshold spatial distance to define placement of sidelobe inhibitors for laying out a mask pattern by a first computer design, whereas the instant claims involve descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out a mask pattern by a second computer design. The Stanton '519 patent claims also do not specifically recite other instantly claimed limitations that are taught by Hasegawa et al., as discussed above.

However, it would still have been obvious to one of ordinary skill in the art at the time of the invention in the photomask, mask, reticle, or radiation-patterning tool design and computer readable media embodying computer readable code for determining placement of sidelobe inhibitors for laying out a mask pattern by a first computer design (as recited by the patent claims of Stanton '519) to utilize an alternative second computer design known for some time that involves descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out the mask pattern (as taught by Hasegawa et al. and previously set forth above), both of which are computer derived mathematical constructs for determining the placement of sidelobe inhibitors on a mask.

Claims 4, 11-12, 16, and 20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 6-12, 14-18, 20, 22, 24-25, 35-38, and 43-46 of US Patent 6,807,519 (Stanton '519) in view of Hasegawa et al. (US Patent 5,700,601, as discussed above), and further in view of Kobayashi et al. (US Patent 5,700,606, as discussed above). The conflicting claims of Stanton '519 are not identical to the instant claims, at least because the Stanton '519 patent claims recite relative spatial orientations of mask elements and vectors spanning between edges of design features within a threshold spatial distance to define placement of sidelobe inhibitors for laying out a mask pattern by a first computer design,

Art Unit: 1756

whereas the instant claims involve descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out a mask pattern by a second computer design. The Stanton '519 patent claims also do not specifically recite other instantly claimed limitations that are taught by Hasegawa et al. and Kobayashi et al., both of which are discussed above.

However, it would still have been obvious to one of ordinary skill in the art at the time of the invention in the photomask, mask, reticle, or radiation-patterning tool design and computer readable media embodying computer readable code for determining placement of sidelobe inhibitors for laying out a mask pattern by a first computer design (as recited by the patent claims of Stanton '519) to utilize an alternative second computer design known for some time that involves descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out the mask pattern (as taught by Hasegawa et al. and previously set forth above), both of which are computer derived mathematical constructs for determining the placement of sidelobe inhibitors on a mask. It would also have been obvious in the combined second computer design of sidelobe inhibitors for laying out a mask pattern (as recited by the patent claims of Stanton '519 and taught by Hasegawa et al., previously set forth above) to design the mask pattern having a single sidelobe inhibitor at a single common location in lieu of separate sidelobe inhibitors at plural locations, when needed to accommodate the greater intensity of unwanted sidelobes at closer pitches for main contact openings on the mask having a greater number of calculated and identified diffraction ring overlap intersections at or near a common location (as taught by Kobayashi et al. and discussed above). With this combined method of designing the mask and a computer-readable medium having computer-executable

Art Unit: 1756

instructions thereon for designing this mask pattern, it is easy to calculate diffraction rings corresponding to the position and size of plural main contact openings on the mask, identify intersection location(s) for adjacent diffraction rings (e.g., with a guard ring extension or another similar mathematical construct around each intersection location for defining a common location in lieu of plural locations when such plural locations are closer or more proximate than a predetermined threshold (*instant claim 11*) to avoid overlap of plural sidelobe inhibitors each having a width or side dimension of about $\lambda/2$ (as discussed above, *instant claim 12*) or when plural guard ring extensions overlap (*instant claims 16 and 20*), etc.), and place one or more sidelobe inhibitor pattern(s) at predetermined position(s) on the mask with high accuracy to prevent, inhibit, suppress, or mitigate sidelobe printing from the mask, as recited by the patent claims of Stanton '519 in combination with the teachings of Hasegawa et al. and Kobayashi et al. (reading on *instant claim 4*).

Claims 1-3, 5-10, 13-15, 17-19, and 21-22 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 51-61 of copending Application No. 10/953,982 (corresponding to US Publication 2005/0049839, Stanton '982) in view of Hasegawa et al. (US Patent 5,700,601, as discussed above). The conflicting claims of Stanton '982 are not identical to the instant claims, at least because the Stanton '982 application claims recite a method of forming a reticle, photopatterning tool, or mask that includes defining pattern features on the mask and determining which pattern features are within a threshold distance between these pattern features that can lead to sidelobe overlap, calculating vectors describing the distance and direction between edges of the pattern features that are within the threshold spatial distance, utilizing the vectors to identify regions of the mask where sidelobe

Art Unit: 1756

overlap can occur (for laying out a mask pattern by a first computer design), and forming sidelobe inhibitors across at least some of the identified regions of the mask, whereas the instant claims involve descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out a mask pattern by a second computer design. The Stanton '982 application claims also do not specifically recite other instantly claimed limitations that are taught by Hasegawa et al., as discussed above.

However, it would still have been obvious to one of ordinary skill in the art at the time of the invention in the method of forming a reticle, photopatterning tool, or mask that includes determining placement of sidelobe inhibitors for laying out a mask pattern by a first computer design (as recited by the application claims of Stanton '982) to utilize an alternative second computer design known for some time that involves descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out the mask pattern (as taught by Hasegawa et al. and previously set forth above), both of which are computer derived mathematical constructs for determining the placement of sidelobe inhibitors on a mask.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claims 4, 11-12, 16, and 20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 51-61 of copending Application No. 10/953,982 (corresponding to US Publication 2005/0049839, Stanton '982) in view of Hasegawa et al. (US Patent 5,700,601, as discussed above), and further in view of Kobayashi et al. (US Patent 5,700,606, as discussed above). The conflicting claims of Stanton '982 are not identical to the instant claims, at least because the Stanton '982 application claims recite a method of

Art Unit: 1756

forming a reticle, photopatterning tool, or mask that includes defining pattern features on the mask and determining which pattern features are within a threshold distance between these pattern features that can lead to sidelobe overlap, calculating vectors describing the distance and direction between edges of the pattern features that are within the threshold spatial distance, utilizing the vectors to identify regions of the mask where sidelobe overlap can occur (for laying out a mask pattern by a first computer design), and forming sidelobe inhibitors across at least some of the identified regions of the mask, whereas the instant claims involve descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out a mask pattern by a second computer design. The Stanton '982 application claims also do not specifically recite other instantly claimed limitations that are taught by Hasegawa et al. and Kobayashi et al., both of which are discussed above.

However, it would still have been obvious to one of ordinary skill in the art at the time of the invention in the method of forming a reticle, photopatterning tool, or mask that includes determining placement of sidelobe inhibitors for laying out a mask pattern by a first computer design (as recited by the application claims of Stanton '982) to utilize an alternative second computer design known for some time that involves descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out the mask pattern (as taught by Hasegawa et al. and previously set forth above), both of which are computer derived mathematical constructs for determining the placement of sidelobe inhibitors on a mask. It would also have been obvious in the combined method of designing and forming a reticle, photopatterning tool, mask, photomask, or radiation-patterning tool that includes determining placement of sidelobe inhibitors for laying out a mask pattern by a second computer design of

Art Unit: 1756

sidelobe inhibitors for laying out a mask pattern (as recited by the application claims of Stanton '982 and taught by Hasegawa et al., previously set forth above) to design the mask pattern having a single sidelobe inhibitor at a single common location in lieu of separate sidelobe inhibitors at plural locations, when needed to accommodate the greater intensity of unwanted sidelobes at closer pitches for main contact openings on the mask having a greater number of calculated and identified diffraction ring overlap intersections at or near a common location (as taught by Kobayashi et al. and discussed above). With this combined method of designing and forming the mask and a computer-readable medium having computer-executable instructions thereon for designing this mask pattern, it is easy to calculate diffraction rings corresponding to the position and size of plural main contact openings on the mask, identify intersection location(s) for adjacent diffraction rings (e.g., with a guard ring extension or another similar mathematical construct around each intersection location for defining a common location in lieu of plural locations when such plural locations are closer or more proximate than a predetermined threshold (*instant claim 11*) to avoid overlap of plural sidelobe inhibitors each having a width or side dimension of about $\lambda/2$ (as discussed above, *instant claim 12*) or when plural guard ring extensions overlap (*instant claims 16 and 20*), etc.), and place one or more sidelobe inhibitor pattern(s) at predetermined position(s) on the mask with high accuracy to prevent, inhibit, suppress, or mitigate sidelobe printing from the mask, as recited by the application claims of Stanton '982 in combination with the teachings of Hasegawa et al. and Kobayashi et al. (reading on *instant claim 4*).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Arguments

Applicants' arguments with respect to claims 1-22 have been considered, but they are either unpersuasive in regard to those rejections maintained above, at least in part, or moot in view of the revised ground(s) of rejection set forth above, which have been necessitated by Applicants' current amendment.

Applicants have tried to distinguish the instant claims by adding further limitations (e.g., that now require the sidelobe inhibitor(s) to pass radiation in the same phase as the radiation passing through the main pattern elements (instant claim 1 as amended), etc.). Applicants argue on pages 28-33 of the current amendment that the instant sidelobe inhibitor(s) passing radiation in the same phase as the radiation passing through the main pattern elements is distinguished over the prior art 180° phase difference between the transparent main pattern and the adjacent surrounding semitransparent phase shifter (PS) taught in the abstract of Hasegawa et al. However, this comparison of different parts is entirely irrelevant. Hasegawa et al. teaches a mask having a transparent main pattern area (passing non-PS radiation, e.g., light at 0°, etc.), a surrounding semi-transparent film (also a phase shifter passing PS radiation, e.g., light at 180°, etc.), and a transparent auxiliary pattern of sidelobe inhibitor(s) (that passes radiation in the same phase (non-PS) as that of the transparent main pattern area, e.g., light at 0°, etc.) placed around or near the main pattern area to prevent generation of an unnecessary projected image (for mitigating, suppressing, or inhibiting sidelobes). Accordingly, Applicants' further limitations added to the instant amended claims have been addressed by revising the previous art rejections over the same prior art references as were previously used, which have been set forth above as necessitated by amendment.

Art Unit: 1756

Therefore, the above objections and rejections are now made FINAL.

Conclusion

Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1756

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

jsr



**S. ROSASCO
PRIMARY EXAMINER
GROUP 1500**